MDA Horticulture Fund 2005 Progress Report

Project Title: Assessment of plant species for Michigan green roof applications
Project Number: MDA #91652
Principal Investigator: Bradley Rowe
Reporting Period: 2005

Accomplishments during reporting period:

Potential green roof plant species are being evaluated for rate of establishment, environmental tolerances, survival, groundcover density, ability to exclude invasive weeds, and long-term plant succession by utilizing image analysis and the use of a point frame transect.

An initial growth and coverage study was initiated in 2005 on 24 raised roof platforms at the MSU Horticulture Teaching and Research Center. The twenty-four 123 cm X 123 cm platforms were constructed by ChristenDETROIT Roofing Contractors (Detroit, MI). The study is a split-plot completely random design with three substrate depths (2.5, 5.0, and 7.5 cm) as the main plot factor and 25 Crassulacean species as the sub-plot factor. Each species is replicated eight times within each substrate depth for a total of 600 plants. Stem and leaf cuttings of plant species were randomly placed on 20 cm centers with 25 individual species per plot.

Survival rates were recorded during establishment and at the end of the first growing season (November 2005). Of the 25 species initially planted, only 47% survived drought conditions in the shallowest substrate of 2.5 cm. Survival and percent coverage were recorded monthly during the 2005 growing season. In addition, digital images of platforms were taken every other week with a camera suspended approximately 163 cm above the platforms on a portable camera stand. Plant growth rates and horizontal vegetative coverage attributed to each species was determined from these images in a non-destructive method by utilizing SigmaScan Pro 5.0 image analysis software (SPSS Science, Chicago, Ill.). Coverage in each plot was calculated to compare growth relative to substrate depth. Preliminary results show that deeper substrates promote greater survival and growth, however, in the shallowest depth of 2.5 cm, several species were observed to form stable communities.

Planned activities for next reporting period:

During 2006, we expect that it will be difficult to distinguish individual plants from image analysis. Therefore, a point-frame transect will be utilized to measure species frequency (area of foliage) and diversity. The transect used will be a stainless steel frame with ten strings (50 pound fish line) separated by 10 cm increments running in both directions across the frame creating a 100 point grid. Another set of strings located 3.8 cm below that creates another 100 points of intersection parallel to the top grid. Accuracy is assured as the point frame will be placed over four pegs that were permanently attached at the corners of each plot. During data collection, a needle will be inserted vertically through each of the 200 points where the wires cross and all species that came in contact with the needle are recorded. For inter-specific contacts, location within the canopy layers will also be documented. Individuals will be counted

once for every point they were present at each of the 200 points. This data will then be statistically analyzed to provide information on species competition and diversity.

Other funding or contributions related to project:

Gifts in kind of green roof drainage systems, substrate carriers, growing media, and plant material, etc. totaling $50,000 have been donated by numerous industry participants. Sources for the non-Horticulture Fund dollars include Ford Motor Company, XeroFlor America, LLC, Project GREEEN, the Perennial Plant Association, and the MSU Office of the Vice-President of Finance and Operations.

Publications/ outreach activities related to project:

Three peer reviewed scientific articles regarding green roof plants selection and stormwater management appeared in print during 2005 (HortScience 40(2):391-396; HortScience 40(3):659-664; J. Environ. Quality 34(3):1036-1044)). Another is due to be published in July 2006 in HortTechnology 16(3):xx-xx. However, these were not directly related to this particular study.

Results have been presented at conferences such as Green Roofs for Healthy Cities, in MSU classes, and numerous tours of the research site have been conducted for such groups as MNLA.

A second research green roof was installed on a portion of the Communication Arts Building during may 2005.

Information has been posted on our green roof website www.hrt.msu.edu/greenroof. Between 22 August 2005 and today (24 January 2006) there have been 5600 hits on the web site.